no results unless the tip is present. The meristem in *Lupinus*, the form used, is starch free, consequently this interpretation which seems to agree well with all facts observed is opposed to the starch statolith theory.—WILLIAM CROCKER.

Gummosis.—SORAUER,[11] in two extensive papers, discusses gum-flow in the cherry and related phenomena in some other trees. He concludes that the tendency to gummy degeneration is latent in the cherry tree, and that stimuli such as frost and wounds only accentuate a natural tendency. Individual cells in the pith and bast, which in perfectly normal twigs of various trees show swelling of the walls and discoloration and degeneration of the contents, exhibit the primary evidences of the tendency to gummosis. Through variations in growth that may be regarded as normal, such as unusual breadth of the medullary rays, or through variations in nutrition affecting turgor, or through wounds, effects of frost, etc., the tension relations between pith and wood, and between wood and bark, are frequently greatly altered, resulting in release of pressure at certain points. At these points, islands of parenchymatic cells are regularly formed, among and in place of the normal prosenchymatic cells. This is a common phenomenon in many trees, without gummosis following; but in the cherry such islands of cells are the usual foci of gummy degeneration. They are particularly numerous in the wood formed by late fall growth; consequently different parts of the same branch or tree vary enormously in the tendency to gummosis.

Cells having the tendency to gummosis are deficient in starch, thin-walled, with heavy deposits of tannin and phloroglucin; in a word, they are cells which fail to mature. The cause of degeneration may be regarded as an excess of enzymes; degeneration in the individual cell starts in the cell contents, and extends to the secondary membrane, which swells and furnishes the chief material for the gum. As the gummosis extends to adjacent cells the order is of course reversed, the intercellular substance being first attacked, the cell contents last.

The bulk of these papers is devoted to a minute description of the histology and microchemical reactions of a great quantity of material illustrating various aspects of the gummosis problem. In addition to various species and varieties of *Prunus*, the following species are studied: *Corylus avellana*, *Pinus Laricio*, *P. silvestris*, *Fagus silvatica*, *Fraxinus excelsior*, *F. Ornus*, *Syringa vulgaris*, *Cytisus Laburnum*, *Tilia* sp., *Ampelopsis* sp., *Platanus* sp., and the pear. Scant attention is given to the work of previous investigators. These papers are of great value for the abundance of detailed observations, but the logic of the deductions is at times difficult to follow.

---

[11] SORAUER, PAUL, Untersuchungen über Gummifluss und Frostwirkungen bei Kirschbäumen. Landwirtsch. Jahrb. **39**:259–297. *pls. 5.* 1910; and **41**:131–162. *pls. 2.* 1911.

BUTLER[12] rejects the earlier view of BEIJERINCK and RANT, that gummosis is due to a cytase which, unable to attack the wall of a living cell does so as soon as the cell is injured from any cause. He also rejects RUHLAND'S view that the gum is an oxidation product of carbohydrates and that gummosis is caused by admission of air through wounds. BUTLER considers that "gummosis is due to hydrolysis of the walls of the embryonic wood cells, which develop into a susceptible tissue." The form of development of a spot of gummosis shows, however, that it is correlated with release of pressure of the cortical tissues. Gummosis does not occur unless the cambium is growing actively and there is an abundant supply of water available to the roots; when these two conditions are present gummosis may develop "autogenously" or be induced by any sort of injury that stimulates growth of the cambium. Contrary to previous investigators, BUTLER states that starch and other cell contents play no part in gum formation. "Gummosis of *Prunus* and gummosis of *Citrus* are indistinguishable maladies." Both squamosis and exanthema are considered to be forms of gummosis. An excellent bibliography is appended.—HAVEN METCALF.

Root habits of desert plants.—In studying the roots of plants growing near the Desert Laboratory, Tucson, Ariz., CANNON[13] has made a rather detailed investigation of more than 60 species, including winter and summer annuals as well as various types of perennials. Three general types of root systems are recognized, namely, a generalized system with both tap and lateral roots well developed, a specialized type with the tap root the chief feature, and a second specialized type in which the laterals, placed near the surface of the ground, are especially well developed. The cacti are almost the sole representatives of the last type, and represent a specialization of a xerophytic form capable of absorbing a water supply from rains which penetrate a few centimeters only. This type seems necessarily limited to plants with very considerable water-storage capacity. A further specialization in the roots of most cacti is to be seen in the development of an anchoring and an absorbing system.

Plants having prominent tap roots include comparatively few species. They are mostly perennial in habit and limited in their distribution to areas with considerable depth of soil. In contrast, the generalized system is characteristic of the majority of both the perennial and annual species. It facilitates distribution because of its plasticity, and because its representatives are found in widely varying situations. It is to be regarded as the least xerophilous of

---

[12] BUTLER, ORMOND, A study on gummosis of *Prunus* and *Citrus*, with observations on squamosis and exanthema of the *Citrus*. Ann. Botany **25**: 107–153. *pls. 4*. 1911.

[13] CANNON, W A., The root habits of desert plants. Carnegie Institution of Washington. Publ. No. 131. pp. 96. *pls. 23*. 1911.